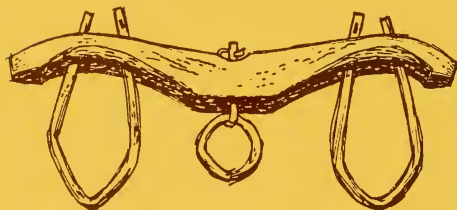


ABRAHAM LINCOLN INVENTOR

B. G. FOSTER

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ABRAHAM LINCOLN INVENTOR

B. G. Foster

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FOREWORD.

Rarely indeed does an invention come as a brilliant flash and in perfect form from the brain of its creator. Like other things in this world it is ordinarily a process of evolution. When one looks upon Benjamin Franklin's printing press whose platen was laboriously raised and lowered by a hand screw and compares it with the modern high speed machines that turn out faster than the eye can follow, hundreds of thousands of copies of the modern bulky newspapers, when one looks upon the crude little implements that sent by wire from Baltimore to Washington the momentous question "What hath God wrought?", and compares with them the subtle instruments that transmit vocal and visual messages instantly to the far-flung parts of the world, one is lost in wonder and admiration at the mechanical progress that man has made in the last few decades. And yet it has always been a gradual development. Without the first step, there could have been no last step. The initial milestone must be passed before the thousandth can be reached. And were it not for the lowly genesis there could never be full fruition.

All honor then to those who dared the self-satisfied world, who dared the gibes, the ridicule, the good natured raillery of their contented neighbors and friends, to give to humanity a new line of thought or opened a new field of endeavor, whether time proved it to be good, bad or indifferent. For of course many of the ideas and schemes on which inventors have built high hopes, which in their imaginations were to revolutionize the world and they

that live therein, proved to be fallacious or were so far in advance of their times as to be then useless.


No wheat is produced without chaff. Indeed chaff is as vital to the production of wheat as wheat is to the support and comfort of mankind. And then it is a remarkable fact that those things which have been once classed as worthless waste, something discarded as utterly useless, in time become most valuable assets. The cotton seed that was once the bane of the cotton ginner is now a most useful product. The fumes from the coke ovens that once permeated the air with obnoxious odors are now carefully saved for the valuable constituents therein contained. The coal tar residue, that horrible sticky mess that was once the despair of all producers has been found to have locked in its heart and in everlasting form the gorgeous hues of the sunset, the essence of Ceylon and the drugs of far Cathay.

Experience has shown that the desire to invent, to do something novel, to give to the world what no one has ever had to give before, is ingrained in the human soul. It is that innate desire and the resolve to put it into effect that so greatly differentiates humanity from the brute creation. Nor does that longing ever seem to entirely leave one. It may be submerged and held back by adverse conditions, but when the opportunity affords, it rises to the surface and when the secret longing coupled with the bravery, demands one to cast the die and launch the scheme upon a waiting world, the United States Patent Office, that great repository of human endeavor and progress, becomes the recipient of the addition to the field of knowledge, in the form of an application for patent.

It is not strange then to find among the Patent Office records the ideas and schemes of hundreds of thousands,

who have made efforts to subscribe to the material advancement of the world. No one not familiar with those records has any conception of the ingenuity and originality that has in times past been displayed by this army of unknown thinkers. It is a fact that no matter how strange a scheme, no matter how brilliant an idea may be developed today, the germ of it in some form, crude and impracticable perhaps, can be found tucked away in some obscure and perhaps ancient patent document, there awaiting modern conditions and developments to make it useful to mankind.

And so it has occurred to the writer that a somewhat striking example of the foregoing is found in the early ingenuity and inventive work of no less a person than Abraham Lincoln, Sixteenth President of the United States.



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ABRAHAM LINCOLN,
INVENTOR

Abraham Lincoln, Inventor

I.

The year was 1831, and it was spring. The brown prairies of Illinois were being rapidly freed from their heavy coverlet of snow. Each little rivulet was adding its tribute of snow water to some larger stream and each stream was pouring its collection into the neighboring river. And there on the bank of the Sangamon, sweeping by in full flood, labored a band of husky young frontiersmen. During the long winter months they had looked forward to the opening of spring, for it meant the beginning of a great adventure.

Denton Offutt, local trader and promoter had engaged these young huskies to take a boat-load of produce down to New Orleans. Aside from the attractiveness of fifty cents a day pay and a bonus of \$60. was the opportunity of getting beyond the restricted confines of their home country and of seeing the great outside world. Offutt, a great promiser, but a poor producer, had agreed to have ready that spring a boat fully equipped and fitted for the voyage. But like so much of Offutt's offerings, when the somewhat motley crew appeared to embark, there was no boat—nothing to embark upon. Disappointment no doubt reigned supreme. All the plans, all the anticipated enjoyments talked over before the fireplaces in the log cabins those long winter evenings had gone to smash.

Was the expedition abandoned and did an angry but secretly heart-sick group of young men plod their way

back home across the muddy prairies? Not at all. If "Denny" by his own industry wouldn't live up to his agreement, they'd help him to. And so with axe and adz and saw and maul a crude but ample flat boat took form. Its possibilities, its seaworthiness and all the mighty problems of ship building were no doubt seriously discussed and determined upon before the campfire after the day's labor was over. In any event, the boat seems to have proven entirely satisfactory to the delinquent Offutt, for it was duly launched, it successfully floated and was loaded with his produce and wares.

On the morning of the departure the little settlement of New Salem nestling on a high bluff of the Sangamon River, below the scene of the boat building operations, awoke to its usual simple and somewhat humdrum tasks. But here was an extraordinary event. A rough but ready and deeply weighted argosy came ponderously into view, riding the swollen river and guided by poles and steering oar in the hands of three young fresh water sailors. Quite naturally word of the novel sight spread and the inhabitants collected to gaze on the passage of this rare craft bound on to the turn of the river and the unknown world beyond. Alas they were to gaze longer than they expected.

At New Salem the Sangamon River had been harnessed to a grist mill and consequently across the stream had been thrown a rough dam of stones over which the river in its flood stage merrily and swiftly passed. Whether the navigators forgot or were unaware of the barrier or whether they "figgered" there was enough water to carry them over the obstruction, history sayeth not. But history doth say that when the dam was reached by the boat, the boat was also reached by the dam. Hence the

hardy but not particularly skilled mariners were soon concerned with the fact that their vessel had slid partly over and there lodged. Here was indeed a sight for the villagers and a dilemma for the sailors. Inspection showed that the bow was well over the dam and out of water while the stern was above the dam with the wavelets dancing over the rim and the racing water boiling menacingly along the gunwales.

It was probably not the first time these hardy young fellows had been suddenly placed on their own resources. And while all might have been equal to the occasion, as usual in time of crisis one quickly came into commanding prominence. A long, lean, gaunt young giant who was later to become well known to the citizens of New Salem under the name of "Abe" Lincoln, took charge of the situation.

The following is a contemporary word picture of this young man.

"He was a tall, gaunt young man dressed in a suit of blue homespun jeans, consisting of a roundabout jacket, waistcoat and breeches which came to within about four inches of his feet. The latter were encased in rawhide boots."

A hasty survey showed no time was to be lost or the boat would fill and sink with all its cargo. Hailing the villagers on shore (among whom was the now anxious Offutt) a boat was launched and brought alongside the stranded vessel. Into this was piled package and box and bale, leaving however, the barrels and casks. Thus lightened the boat still tetering uncomfortably on the rocks, was however temporarily safe. Then came the problem of removing the water and getting the boat over the dam. And here was displayed the ingenuity of the gaunt young

unknown stripling who had directed and worked powerfully in unloading the craft.

The heavy barrels left in the boat were all rolled to the bow that projected beyond the dam and above the water. The front end thus weighted swung downwardly, and the rear end thereby lightened, rose safely above the flood that raced around it, while all the water shipped into the boat over the stern promptly followed the barrels into the bow. Then "Abe" according to the story, borrowed a goodly sized auger from the blacksmith at New Salem and proceeded to bore a hole through the bottom of the bow. The water that had run in made haste to flow out through the aperture thus produced and resume its journey to the sea. After the last departing drops trickled through the hole "Abe" plugged it up and with the aid of the water now pushing against the upturned stern, it was an easy task to slide the boat on over the dam, bring her to shore, reload and continue the journey.

Very little is known of the details of that long trip down the Mississippi to New Orleans. It probably did not differ greatly from thousands of others of a corresponding character. Mark Twain's stories dealing with such life on the Mississippi have become an immortal part of the literature of the nation. No doubt snags and shifting sand bars were encountered and beginning with his experience at the Rutledge mill dam at New Salem, the problem of safely and satisfactorily navigating the shallow inland waters of the country evidently impressed itself on young Lincoln.

II.

We pass on to a period some seventeen years later. The Hon. Abraham Lincoln of Springfield, Sangamon



“NECESSITY THE MOTHER OF INVENTION”

County, Illinois, had been elected to the National House of Representatives and had taken his seat in Congress. The first session was over and he determined to return to his home by way of Niagara Falls and the Great Lakes. The vessel on which he journeyed apparently was making a normal and uneventful voyage along the lake until she had the misfortune to run aground.

It must have carried Mr. Lincoln's thoughts back to his early experiences—the voyage down the Sangamon, the mishap on the dam at New Salem, and probably other near wrecks and delays on the shifting and uncharted mud banks of the Illinois and the great Mississippi. It was not strange then that the Captain's endeavors to release his vessel from the bar on which she struck was of deep interest to Mr. Lincoln. Planks and empty barrels were placed under and around her and after much delay the boat was finally backed off.

Through all the preceding years perhaps, the problem had been vaguely revolving in his mind—this constant difficulty of boats running aground with the consequent troubles and delays, and the crude methods and make-shifts used in getting them again afloat. And after all these years, apparently no definite solution of the problem was available. The lake captain of 1848 was no better off then Capt. "Abe", the Mississippi boatman of twenty years before.

Something ought to be done and why was not he the man to show the way? And Mr. Lincoln decided to do it. The next chapter of the story is best given in the words of his law partner, W. H. Herndon, of Springfield, Illinois.

"Continual thinking on the subject of lifting vessels over sand bars and other obstructions in the water suggested to him the idea of inventing an apparatus for the

purpose. Using the principle involved in the operation he had just witnessed (the release of the lake boat), his plan was to attach a kind of bellows on each side of the hull of the craft just below the water line, and, by an odd system of ropes and pulleys, whenever the keel grated on the sand these bellows were to be filled with air and thus buoyed up, the vessel was expected to float clear of the shoal. On reaching home he at once set to work to demonstrate the feasibility of his plan. Walter Davis, a mechanic having a shop near our office, granted him the use of his tools and likewise assisted him in making the model of a miniature vessel with the arrangement as above described. Lincoln manifested ardent interest in it. Occasionally he would bring the model in the office, and while whittling on it would descant on its merits and the revolution it was destined to work in steamboat navigation. Although I regarded the thing as impracticable, I said nothing, probably out of respect for Lincoln's well-known reputation as a boatman. The model was sent or taken by him to Washington, where a patent was issued, but the invention was never applied to any vessel, so far as I ever learned, and the threatened revolution in steamboat architecture and navigation never came to pass."

The reason for the production of the model was the requirement of the Patent Office at that time that an application for patent must be accompanied by a model of the invention.

So it is not strange that Mr. Lincoln on returning to Washington for the second term of Congress took the model with him, and we have the following record from Z. C. Robbins of Washington, D. C., the attorney who represented him before the Patent Office.

"He walked into my office one morning with a model of a western steamboat under his arm. After a friendly

To the Commissioner of Patents.

The Petition of *Abraham Lincoln, of Springfield*
in the County of Sangamon & State of Illinois
Respectfully represents.

That your petitioner *has* invented, a new and improved
manner of combining adjustable buoyant
chambers with steam boats or other vessels

which has not, as *he* verily believes been heretofore used or known, and that *he*
is desirous that Letters Patent of the United States may be granted to *him* there-
for, securing to *him* and to *his* legal representatives, the exclusive right of making
and using, and of vending to others the privilege to make or use, the same, agreeably
to the provisions of the Acts of Congress in that case made and provided, *he*
having paid *only* dollars into the Treasury of the United States, and complied
with other provisions of the said Acts.

And *he* hereby authorises and empowers *his* Agent and Attorney, Z. C.
ROBBINS, to alter or modify the within specification and claim as he may deem expe-
dient, and to receive *his* patent; and also to receive back any moneys which *he*
may be entitled to withdraw, and to receipt for the same.

A. Lincoln

County of Washington
District of Columbia } ss.

On this *10th* day of *March* 18*49*
before the subscriber, a *free* *man* in and for the said *County* personally
appeared the within named *Abraham Lincoln*
and made solemn oath according to law, that *he* believes himself
to be the original and first inventor of the within described *improved*
manner of combining adjustable buoyant
chambers with steam boats or other
vessels and that *he* does not know or believe
that the same has been before used or known; and that *he* is a citizen of the
United States.

J. S. Smith Jr.

MR. LINCOLN'S PETITION FOR A PATENT

(Courtesy of The United States Patent Office)

greeting he placed his model on my office table and proceeded to explain the principles embodied therein and what he believed to be his own invention, and which, if new, he desired to secure by Letters Patent. During my former residence in St. Louis, I had made myself thoroughly familiar with everything appertaining to the construction and equipment of the flat-bottomed steamboats that were adapted to the shallow rivers of our western and southern States, and therefore, I was able speedily to come to the conclusion that Mr. Lincoln's proposed improvement of that class of vessels was new and patentable, and I so informed him. Thereupon he instructed me to prepare the necessary drawings and papers and prosecute an application for a patent for his invention at the United States Patent Office. I complied with his instructions and in due course of proceedings procured for him a patent that fully covered all the distinguishing features of his improved steamboat."

It does not appear that Mr. Lincoln ever made any endeavor to exploit his invention or have it adopted or even tried out on a full sized vessel. The original records of the patent have lain undisturbed among the files of the Patent Office for eighty years. The model slumbered on the shelves until the manifold inventive activities of the present generation made more room essential. As a consequence the large assembly of old models was disposed of except a few of real historical value that have been preserved in the National Museum at Washington. And there the model of Abraham Lincoln's invention is now safely treasured.

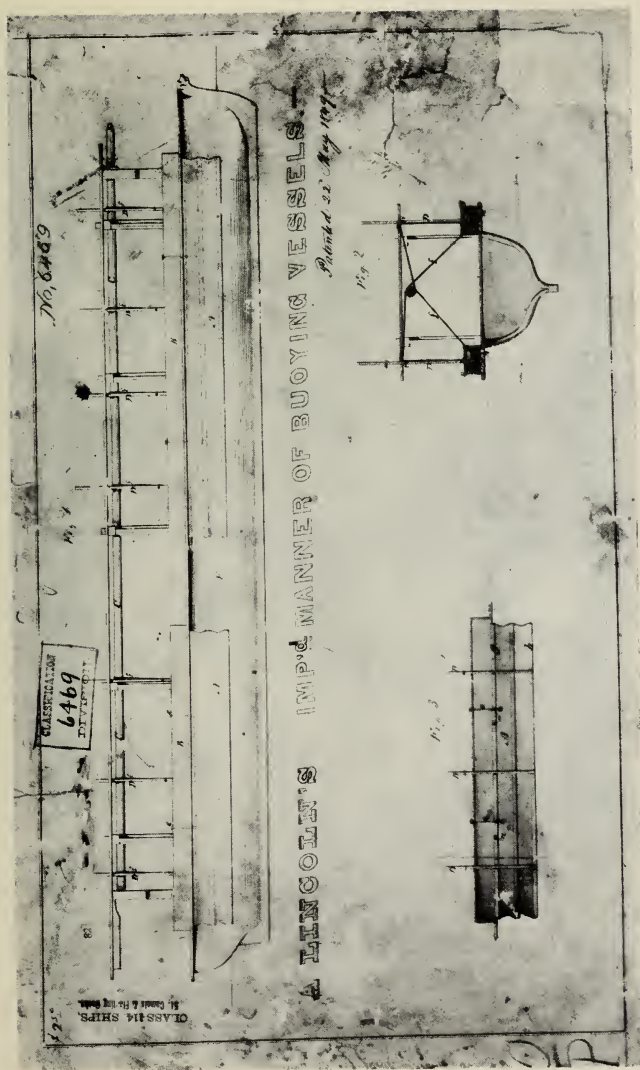
III.

The year of 1926 came and the rivers still continued their journeys to the sea. Steamers still plied, though in

very limited numbers, along those inland waters traversed by Abraham Lincoln a century ago. Instead of vessels being removed from shoals, the shoals and sand bars have been dredged away and thereby removed from the paths of vessels, and Mr. Lincoln's contribution to navigation, if ever practicable, would appear to have become obsolete.

And yet there is the germ of a practically useful scheme for modern purposes to be found therein. It is now the common practice to lighten and raise sunken ships by air pontoons lashed to their sides. Twice (in 1926 and 1928) have our naval submarines that have had the misfortune to have been sunk, been brought again to the surface and salvaged. This has in each instance been made possible by the attachment of great air chambers or pontoons to opposite sides of the sunken vessel. Into these chambers air was pumped and sufficient buoyancy thus produced to raise the vessel from its ocean bed to the surface and permit it to be towed to a safe refuge for repair and reconditioning. It has been proposed to supply war vessels with permanent chambers, familiarly known as "blisters", on the sides of their hulls. These chambers may be used for storage purposes, or they can be flooded, or air can be pumped into them to buoy up one side or the other and thus cause a "list" or tilting of the ship to elevate the guns.

It may seem a far cry to these modern developments, and yet there is to be found in the modern engineering field of ship salvaging operations the fundamental thought underlying the seemingly impracticable scheme proposed by Mr. Lincoln so many years ago,—the buoying up of a vessel by air chambers placed along the opposite sides of her hull.



MR. LINCOLN'S ORIGINAL PATENT DRAWINGS

(Courtesy of The United States Patent Office)

IV.

It may not be amiss in conclusion to show how deeply Abraham Lincoln must have even in later years pondered the subject of inventions and their relation to the advance of the human race. Temporarily withdrawn from political activities in 1860 and finding it necessary to seek some method of securing revenue for a livelihood, he determined to try the lecture platform. He thereupon prepared and delivered at Springfield, Illinois in 1860 a lecture entitled "Discoveries and Inventions." It did not prove a financial success but it is interesting as showing much research and especially it indicates that he must have had a very complete knowledge of the Bible. While the lecture as preserved to us appears to be incomplete, that known is as follows (From *The Journal of the Patent Office Society*):

"DISCOVERIES AND INVENTIONS"

"All creation is a mine, and every man a miner.

"The whole earth, and all within it, upon it, and round about it, including himself, in his physical, moral, and intellectual nature, and his susceptibilities, are the infinitely various "leads" from which, man, from the first, was to dig out his destiny.

"In the beginning, the mine was unopened, and the miner stood naked, and knowledgeless, upon it.

"Fishes, birds, beasts, and creeping things, are not miners, but feeders and lodgers merely. Beavers build houses; but they build them in nowise differently, or better now, than they did, five thousand years ago. Ants and honey bees provide food for winter; but just in the same way they did, when Solomon referred the sluggard to them as patterns of prudence.

“Man is not the only animal who labors; but he is the only one who improves his workmanship. This improvement he effects by Discoveries and Inventions. His first important discovery was the fact that he was naked; and his first invention was the fig-leaf apron. This simple article, the apron, made of leaves, seems to have been the origin of clothing—the one thing for which nearly half of the toil and care of the human race has ever since been expended. The most important improvement ever made in connection with clothing, was the invention of spinning and weaving. The spinning jenny, and power loom, invented in modern times, though great improvements, do not, as inventions, rank with the ancient arts of spinning and weaving. Spinning and weaving brought into the department of clothing such abundance and variety of material. Wool, the hair of several species of animals, hemp, flax, cotton, silk, and perhaps other articles, were all suited to it, affording garments not only adapted to wet and dry, heat and cold, but also susceptible of high degrees of ornamental finish. Exactly when, or where, spinning and weaving originated is not known. At the first interview of the Almighty with Adam and Eve, after the fall, He made “coats of skins, and clothed them” (Genesis iii: 21).

“The Bible makes no other allusion to clothing, before the flood. Soon after the deluge Noah’s two sons covered him with a garment; but of what material the garment was made is not mentioned (Genesis ix: 23).

“Abraham mentions “thread” in such connection as to indicate that spinning and weaving were in use in his day (Genesis xiv: 23), and soon after, reference to the art is frequently made. “Linen breeches” are mentioned (Exodus xxviii: 42), and it is said “all the women that were wise-hearted did spin with their hands” (Exo-

\$30 for
 What I claim as my invention and de-
 sire to secure by letters patent, is the
 combination of expandible buoyant cham-
 bers placed at the sides of a vessel, with the main shaft
 or shafts C by means of sliding spars or shafts D, which pass
 down through the buoyant chambers and are made fast to
 their bottoms, and the series of ropes and pulleys or their equivalents,
 the vessel in such a manner that
 by turning the ^{main} shaft ^{or shafts} in one direction,
 the buoyant chambers will be forced
 downwards into the water and at the
 same time expanded and filled
 with air for buoying up the vessel;
 by the displacement of water; and
 by turning the shaft in an opposite
 direction, the buoyant chambers will
 be contracted into a small space
 and secured against injury.

Witness

Witness
 J. C. Robbins
 H. H. Lytton

For said Pat.
 1st Spec 1607

ORIGINAL DRAFT OF MR. LINCOLN'S PATENT CLAIMS

Note the endorsement of payment of the Patent Office for "\$30 gold received."

(Courtesy of The United States Patent Office)

dus xxxv: 25), and, "all the women whose heart stirred them up in wisdom spun goats' hair" (Exodus xxxv: 26). The work of the "weaver" is mentioned (Exodus xxxv: 35). In the book of Job, a very old book, date not exactly known, the "weavers' shuttle" is mentioned.

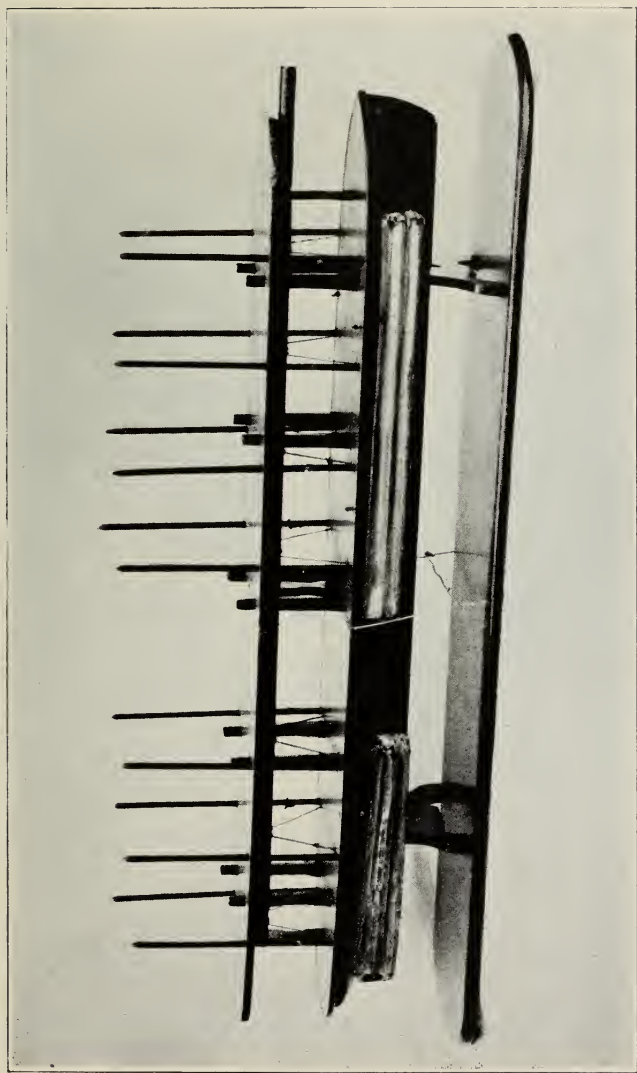
"The above mention of "thread" by Abraham is the oldest recorded allusion to spinning and weaving; and it was made about two thousand years after the creation of man, and now, near four thousand years ago. Profane authors think these arts originated in Egypt; and this is not contradicted, or made improbable, by anything in the Bible; for the allusion of Abraham, mentioned, was not made until after he had sojourned in Egypt.

"The discovery of the properties of iron, and the making of iron tools, must have been among the earliest of important discoveries and inventions. We can scarcely conceive the possibility of making much of anything else, without the use of iron tools. Indeed, an iron hammer must have been very much needed to make the first iron hammer with. A stone probably served as a substitute. How could the "gopher wood" for the Ark have been gotten out with an axe? It seems to me an axe, or a miracle, was indispensable. Corresponding with the prime necessity for iron, we find at least one very early notice of it. Tubal-Cain was "an instructor of every artificer in brass and iron" (Genesis iv: 22). Tubal-Cain was the seventh in descent from Adam; and his birth was about one thousand years before the flood. After the flood, frequent mention is made of iron, and instruments made of iron. Thus "instrument of iron" at Numbers xxxv: 16; "bedstead of iron" at Deuteronomy iii: 11; "the iron furnace" at Deuteronomy iv: 20, and "iron tool" at Deuteronomy xxvii: 5. At Deuteronomy xix: 5, very distinct mention of "the ax to cut down the tree" is made;

and also at Deuteronomy viii: 9, the promised land is described as "a land whose stones are iron, and out of whose hills thou mayest dig brass." From the somewhat frequent mention of brass in connection with iron, it is not improbable that brass—perhaps what we now call copper—was used by the ancients for some of the same purposes as iron.

"Transportation—the removal of person and goods from place to place—would be an early object, if not a necessity, with man. By his natural powers of locomotion, and without much assistance from discovery and invention, he could move himself about with considerable facility; and even, could carry small burthens with him. But very soon he would wish to lessen the labor, while he might, at the same time, extend, and expedite the business. For this object, wheel-carriages, and water-crafts—wagons and boats—are the most important inventions. The use of the wheel and axle has been so long known, that it is difficult, without reflection, to estimate it at its true value. The oldest recorded allusion to the wheel and axle is the mention of a "chariot" (Genesis xli: 43). This was in Egypt, upon the occasion of Joseph being made governor by Pharaoh. It was about twenty-five hundred years after the creation of Adam. That the chariot then mentioned was a wheel-carriage drawn by animals is sufficiently evidenced by the mention of chariot wheels (Exodus xiv: 25), and the mention of chariots in connection with horses in the same chapter, verses 9 and 23. So much, at present, for land transportation.

"Now, as to transportation by water, I have concluded, without sufficient authority perhaps, to use the term "boat" as a general name for all water-craft. The boat is indispensable to navigation. It is not probable that the philosophical principle upon which the use of the



MR. LINCOLN'S PATENT MODEL

(Courtesy of The National Museum)

boat primarily depends—to-wit, the principle, that anything will float, which cannot sink without displacing more than its own weight of water—was known, or even thought of, before the first boats were made. The sight of a crow standing on a piece of driftwood floating down the swollen current of a creek or river, might well enough suggest the specific idea to a savage, that he could himself get upon a log, or on two logs tied together, and somehow work his way to the opposite shore of the same stream. Such a suggestion, so taken, would be the birth of navigation; and such, not improbably, it really was. The leading idea was thus caught; and whatever came afterwards, were but improvements upon, and auxiliaries to, it.

“As man is a land animal, it might be expected he would learn to travel by land somewhat earlier than he would by water. Still the crossing of streams, somewhat too deep for wading, would be an early necessity with him. If we pass by the Ark, which may be regarded as belonging rather to the miraculous than to human invention, the first notice we have of water-craft is the mention of “ships” by Jacob (Genesis xlix: 13). It is not till we reach the book of Isaiah that we meet with the mention of “oars” and “sails.”

“As man’s food—his first necessity—was to be derived from the vegetation of the earth, it was natural that his first care should be directed to the assistance of that vegetation. And accordingly we find that, even before the fall, the man was put into the garden of Eden “to dress it, and to keep it.” And when afterwards, in consequence of the first transgression, labor was imposed on the race, as a penalty—a curse—we find the first born man—the first heir of the curse—was “a tiller of the ground.” This was the beginning of agriculture; and

although, both in point of time, and of importance, it stands at the head of all branches of human industry, it has derived less direct advantage from Discovery and Invention, than almost any other. The plow, of very early origin; and reaping, and threshing machines, of modern invention are, at this day, the principal improvements in agriculture. And even the oldest of these, the plow, could not have been conceived of, until a precedent conception had been caught, and put into practice—I mean the conception, or idea, of substituting other forces in nature, for man's own muscular power. These other forces, as now used, are principally, the strength of animals, and the power of the wind, of running streams, and of steam.

“Climbing upon the back of an animal, and making it carry us, might not occur very readily. I think the back of the camel would never have suggested it. It was, however, a matter of vast importance. The earliest instance of it mentioned, is when “Abraham rose up early in the morning, and saddled his ass” (Genesis xxii: 3), preparatory to sacrificing Isaac as a burnt-offering; but the allusion to the saddle indicates that riding has been in use some time; for it is quite probable they rode bare-backed awhile, at least, before they invented saddles.

“The idea, being once conceived, of riding one species of animals, would soon be extended to others. Accordingly we find that when the servant of Abraham went in search of a wife for Isaac, he took ten camels with him; and, on his return trip, “Rebekah arose, and her damsels, and they rode upon the camels, and followed the man” (Genesis xxiv: 61).

“The horse, too, as a riding animal, is mentioned early. The Red Sea being safely passed, Moses and the children

of Israel sang to the Lord "the horse and his rider hath he thrown into the sea" (Exodus xv: 1).

"Seeing that animals could bear man upon their backs, it would soon occur that they could also bear other burthens. Accordingly we find that Joseph's brethren, on their first visit to Egypt, "laded their asses with the corn, and departed thence" (Genesis xlii: 26).

"Also it would occur that animals could be made to draw burthens after them, as well as to bear them upon their backs; and hence plows and chariots came into use early enough to be often mentioned in the books of Moses (Deuteronomy xxii: 10; Genesis xli: 43; xlii: 29; Exodus xiv: 25).

"Of all the forces of nature, I should think the wind contains the largest amount of motive power—that is, power to move things. Take any given space of the earth's surface—for instance, Illinois; and all the power exerted by all the men, and beasts, and running-water, and steam, over and upon it, shall not equal the one hundredth part of what is exerted by the blowing of the wind over and upon the same space. And yet it has not, so far in the world's history, become proportionately valuable as a motive power. It is applied extensively, and advantageously, to sail-vessels in navigation. Add to this a few wind-mills, and pumps, and you have about all. That, as yet, no very successful mode of controlling, and directing the wind, has been discovered; and that, naturally, it moves by fits and starts—now so gently as to scarcely stir a leaf, and now so roughly as to level a forest—doubtless have been the insurmountable difficulties. As yet, the wind is an untamed, and unharnessed force; and quite possibly one of the greatest discoveries hereafter to be made, will be the taming and harnessing of it. That the difficulties of controlling this power are very

great is quite evident by the fact that they have already been perceived, and struggled with more than three thousand years; for that power was applied to sail-vessels, at least as early as the time of the prophet Isaiah.

“In speaking of running streams, as a motive power, I mean its application to mills and other machinery by means of the “water wheel”—a thing now well known, and extensively used; but, of which, no mention is made in the Bible, though it is thought to have been in use among the Romans. (Am. Ency.-Mill), the language of the Saviour “Two women shall be grinding at the mill, etc.” indicates that, even in the populous city of Jerusalem, at that day, mills were operated by hand—having, as yet had no other than human power applied to them.

“The advantageous use of Steam-power is, unquestionably, a modern discovery. And yet, as much as two thousand years ago the power of steam was not only observed, but an ingenious toy was actually made and put in motion by it, at Alexandria in Egypt. What appears strange is, that neither the inventor of the toy, nor any one else, for so long a time afterwards, should perceive that steam would move useful machinery as well as a toy.”

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